

## CONTROL OF TYPHOID FEVER IN CHICAGO.

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Read before the Public Health Administration Section, American Public Health Association, October 20, 1917  
at Washington, D. C.

CHICAGO, a city of more than two and a half million inhabitants at the present time, grew from nothing to its present size in the short period of eighty years, and necessarily so rapid a growth was attended by crudities in sanitation.

The site upon which the city is built was for the most part low and flat. Some of it was under water. The main business district had to be filled in and raised approximately eleven feet to its present level.

The water supply originally was from wells and the Chicago River which flowed through the center of the growing village into Lake Michigan. Later it became necessary to tunnel under the lake and secure water from a point a considerable distance from shore. In 1867 a tunnel was run out under the lake two and one-half miles from shore through which water was drawn. With a rapidly increasing population on a low, flat margin of the lake the problem was to keep the water free from contamination.

The Chicago River draining the low lands on the west of the city received sewage as it passed through the city and then emptied its contents into the lake. The Calumet River at South Chicago drained the swamp at the southern margin of the city and dis-

charged into Lake Michigan at 92d Street, about ten miles from the intake of the city's drinking water. All the sewers, which did not discharge into the Chicago River were made to flow into the lake so the lake received all the sewage from the city either through these sewers or the river. The Stock Yards, located at one time on the margin of the lake and later on the south branch of the Chicago River, threw its waste and filth into the lake and river.

The conditions were such that an inch rainfall always contaminated the drinking water. This was the condition in 1890 and 1891. The provisions for supplying an adequate amount of water had not kept pace with the rapidly increasing population, and at times the water could not be forced to the upper stories of the buildings. The two and one-half mile crib was the only source of water until the four mile crib was opened in 1891. A tunnel had been run out into the lake 1,500 feet to be used as an emergency supply of water in case of fire.

This loaded shotgun made it possible for some one to commit a crime and the opportunity was not neglected. The sewage laden water from this 1,500 foot tunnel was turned into the drinking water with a resulting death-rate

of 174 per 100,000 population. No one was hanged or even tried for this crime. As the result of this contamination 1,997 died of typhoid fever in Chicago in 1891. This hastened the construction of more tunnels under the lake and to a greater distance from shore.

The completion and opening of the drainage canal, at a cost of \$30,000,000, in 1900, reversed the flow of the Chicago River. All the sewage of the city, which formerly flowed into the lake, was turned into the Chicago River and carried down the drainage canal into the Illinois River. This, with the newly constructed tunnel put in operation in 1891, gave Chicago a pure water supply, except in the newly annexed districts with their own water supply taken from points too near shore.

But a pure water supply can be contaminated where many people dwell. Lake steamers passing the cribs or water intakes can contaminate the water with the excrements from thousands of passengers. The dredgings from the bottom of the sewage laden Chicago River dumped into the lake has at times been a source of contamination. Fifty or more men are at times employed on the crib or intake where the water enters the tunnels to keep ice from choking the inlet. These men can and do contaminate the drinking water. You cannot depend upon men to climb fifty or a hundred feet out of a well to seek the incinerator when in need of doing so. It is easier to use the well through which our drinking water flows. This man may be a "carrier" of typhoid fever bacilli. He may not start an epidemic, but he may kill a few. Men working in the

well at the pumping stations on land are likewise a source of danger. Leakages into the wells from infected sources endanger the water supply. The safeguarding the water supply has long been left largely to the commissioner of public works who is not a doctor. The information as to the condition of the water supply has always been furnished to the commissioner of public works and the public from the Department of Health's laboratory. The dumping of dredgings into the lake and various sources of contamination have all been watched and their danger pointed out. For many years the Department of Health has been active in safeguarding the city's water supply, but not until quite recently has a special competent sanitarian been put in charge with authority to safeguard the water supply. No one but a competent, trained sanitarian with a conscience is fit for such a service. The average engineer cannot be relied upon to eliminate every source of contamination of the water. The 1,500 foot tunnel episode of 1890 and 1891 could not occur now. An outbreak of typhoid fever in February, 1916, the result of carelessness and ignorance on the part of employes whose business it was to keep sewage pumps going and the knowledge of the previously mentioned sources of contamination, led Dr. John Dill Robertson, commissioner of health, to take additional measures to systematically search out all sources of contamination of Chicago's water supply and apply remedies to keep it pure.

He detailed Dr. Herman N. Bunden from the Bureau of Medical In-

spection to devote his entire time to the task of keeping the water free from contamination and in eliminating so far as possible all other sources of typhoid fever. This required an inquiry into every known source of typhoid infection in the water supply, the milk supply, food supply, the summer resorts visited by Chicagoans on vacations or automobile trips.

Chicago pumps approximately 800,000,000 gallons of water daily. All of this water is treated with liquid chlorine. The chlorine is placed into the water at the suction well, is then sucked through the well by engines and distributed into the discharge mains. The dosage varies from time to time depending upon the condition of the water. During the past year the dosage has been from one-tenth part per million parts of water, to two-tenths parts per million parts of water, the average dosage being fifteen hundredths parts per million parts.

Ortho-tolidin standards are placed in each pumping station. A medical inspector from the Health Department calls at each of the pumping stations not less than twice a week to make sure the chlorination is efficient. In addition to this, the engineer on each eight-hour watch at each pumping station also tests the water for free chlorine. The apparatus used in Chicago are the machines of the Electro Bleaching Gas Company and the Wallace and Tierman Company. That chlorine in the Chicago water supply is efficient is demonstrated by the fact that of the hundreds of samples of water taken in 1911 over 18 per cent showed colon in 1 cc.

Of the samples taken the first nine months of 1917 less than one-tenth of 1 per cent of the samples showed colon in 1 cc.

Typhoid fever in Chicago is reportable and a warning card is posted on the house in every case.

A case on being reported is visited by a supervising doctor from the Health Department. He instructs the family how to disinfect the dejecta; shows them what should be done to rid the house of flies; instructs the nurse in charge how to prevent the spread of typhoid infection; establishes a back-door quarantine and obtains all information available as to the possible sources of infection. By back-door quarantine is meant a quarantine which allows the members of the family to come and go at the convenience of the household, but which places restrictions upon those who handle food. The report of the supervisor is made on a blank which calls for specific information as to typhoid vaccinations, regular and occasional water-supply, regular and occasional milk-supply, ice, oysters, vegetables, etc.

In order to facilitate diagnosis, the municipal laboratory of the Health Department makes Widal examinations free of charge. If the specimen of blood for a Widal is submitted before the tenth day of the disease and gives a negative result, another blood specimen for test is requested to be taken after the tenth day. If a case of typhoid fever is reported without a Widal test, one is requested from the family physician.

1. All members of the household are

urged to be immunized and the attendant nursing the case *must* be immunized.

2. The patient must be actually isolated, visitors excluded and dejecta adequately disinfected before disposed of.

3. The attendant on the patient must have nothing to do with the family cooking, care of children or handling of food, except for the patient and self.

4. There must be a water-closet for the exclusive use of the patient's family.

5. The family must be sufficiently intelligent and willing to carry out the rules of the Department of Health for the home care of typhoid fever. Unless these rules are adhered to, the case is hospitalized.

Typhoid fever cases are terminated only by bacteriologic examinations of feces and urine. The specimens for examination are not to be collected before the tenth day after the temperature becomes finally normal. The patient must remain isolated until the negative result has been obtained.

Where the source of the infection is out of town, the local health officer and the state health officer in the city and state from which the case emanates are notified.

As soon as the case is reported, it is spotted on a map. The system used is as follows: A map, with a scale four inches to the mile, mounted on a swinging board is divided into nine districts by a thin, water-color outline of different colors. These color districts represent the approximate water supply from one of the various sources of

supply. The case is then entered in the typhoid record book and is given a number. This number is posted on the map with an ordinary cloth covered tack until all available information is received. Information on the case must be in the office within twenty-four hours from the time it was assigned to the inspector. Different colored beads and tacks are used in making up this map. For instance for the twelve months of the year there are twelve different colored beads, such as blue, pink, white, etc. Thus, if the case had its definite date of onset in January, this would be denoted by a violet bead. These beads are attached to the map by different colored tacks, a red tack denoting that the case had contracted its infection out of town, a yellow tack denoting that it was due to contact, a green tack denoting the source of infection as due to water, a black tack denoting source of the infection—undetermined, as many tacks being used as are required to denote the different sources of infection. Should the case terminate fatally, it is surrounded by a small, black ring. Therefore, a case of typhoid fever occurring in January, having contracted its infection out of town, having terminated fatally and living in the Lake View pumping station district would be indicated as follows: A red tack and a purple bead, having small number attached, encircled by a black ring is posted at the number and street where the patient is under treatment, if the case was at a residence.

A supervising medical inspector has charge of the typhoid fever under the direction of the chief of the Bureau.

He is held directly responsible for the control of the disease.

In addition to the supervising doctor's inspection, a Health Department nurse calls at each home at frequent intervals and personally sees that the excretions are properly disinfected and that the rules are adhered to.

When the case is isolated in a hospital, the hospital attendant that is nursing the typhoid cases is not permitted to attend other cases of sickness, nor are other than typhoid cases permitted to be isolated in the same quarters.

"Carrier" cases are held under quarantine until the bowel and bladder discharges are found free from typhoid bacilli.

The following is a résumé of cases of typhoid fever reported to the Department of Health in 1916:

Total number of cases reported, 1,153. Of these, 119 (11 per cent) proved not to be cases.

Total cases counted, 1,034. These were distributed by months as follows:

January . . . . .	63	August . . . . .	140
February . . . . .	150	September . . .	104
March . . . . .	105	October . . . . .	104
April . . . . .	56	November . . .	65
May . . . . .	66	December . . .	52
June . . . . .	59	—	—
July . . . . .	70		1,034

Of these 659 were males and 375 were females; 129 died (81 males and 48 females). As near as could be ascertained 306 (29.5 per cent) contracted the disease outside of Chicago; 70 (6.7 per cent) were in all probability due to direct contact with other cases;

21 (30 per cent) of these were doctors and nurses caring for typhoid cases. A localized milk epidemic was responsible for 24 (2.3 per cent) cases; 17 (1.6 per cent) were traced to food taken in a school lunch-room; 3 were traced to "carriers"; 105 (10.4 per cent) in all probability contracted the disease from the drinking water, the water at one of the pumping stations having been contaminated January 23. This pollution was discovered and warning to boil the water was sent through school children the following day; 105 cases resulted in the territory which was supplied with water by the pumping station where the sewage reached the water.

In 509 (50.7 per cent) cases the source of infection could not be traced; 238 of these cases handled food of some kind which was consumed by others: 181 housewives, 8 bakers, 7 butchers, 7 cooks, 19 nurses, 4 meat packers, 4 candy makers, 2 milkmen, 3 farmers, 1 maid, 1 grocer, 1 peddler.

The chlorination of the entire water supply was not accomplished until October 6, 1916.

The first nine months of 1917, 235 cases of typhoid fever were reported to the Department of Health, 28 of which died. For the same period last year 813 cases were reported, with 111 deaths resulting. By months the first nine months of 1917:

January . . . . .	32	June . . . . .	17
February . . . . .	14	July . . . . .	17
March . . . . .	21	August . . . . .	40
April . . . . .	12	September . . .	74
May . . . . .	8		